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A New Species of *Piptospatha* (Araceae: Schismatoglottideae) from West Kalimantan, Indonesian Borneo

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As a result of a botanical expedition made as part of the Heart of Borneo Project, a new rheophytic aroid species, *Piptospatha repens* (Araceae: Schismatoglottideae) was found on the Sungai (River) Mendalam, a branch of the Sungai Kapuas, Putussibau, West Kalimantan, Indonesia.

Key words: Araceae, Borneo, Heart of Borneo Project, new species, *Piptospatha*, rheophyte, West Kalimantan

A botanical expedition to Sungai (River) Mendalam, Betung-Kerihun National Park, Putussibau, Kapuas Hulu, Kalimantan Barat (West Kalimantan), Indonesia during December, 2009 and January, 2010 as part of the Heart of Borneo Project aimed to generate fundamental information regarding the conservation of biodiversity in these areas. The Project followed the previous botanical activities in the Muller Range in 2004. The earlier expedition revealed some new species (e.g. Okada 2006). In this paper, a scientifically novel rheophytic aroid of the genus *Piptospatha* N. E. Br. is described. Bogner & Hay (2000) revised the genus *Piptospatha* and recognized 11 species. Boyce & Wong (2008) and Wong *et al.* (2009) revised the genus in Sarawak, East Malaysia, based on additional new information from their field surveys, and published two new species of this genus.

The species found in Betung-Kerihun National Park belongs to the *Piptospatha elongata* group (cf. Bogner & Hay 2000) judged from having a caducous spathe. This species shows, however, unique combination of characters of stem and spadix. Thick and long repent-creeping stems, 6–8 mm in diameter, are distinctive from the thin stems of *P. manduensis* A. Hay & Bogner which are about 2.5 mm in diameter. Its spadix with the ratio of width of female zone to whole length of spadix being 0.1 (3 mm/30 mm) is more slender than those with greater values of 0.13 (4 mm/30 mm; *P. brevipedunculata* (H. Okada & Y. Mori) Bogner & A. Hay) in any other species of the *P. elongata* group (values were calculated from data in Bogner & Hay [2000] and Wong *et al.* [2009]). Further, the presence of intermediate staminodes is conspicuous in the *P. elongata* group and similar to *P. burbidgei* (N. E. Br.) M. Hotta (Appendix).

Piptospatha repens H. Okada & Tsukaya, **sp. nov.**—Figs. 1, 2

Haec species nova ad catervam *Piptospathae elongatae* (sensu Bogner & Hay [2000]) pertinens, sed ab aliis speciebus qujus catervae combinatione caulium repentium crassi cum spadicis cylindicis exilibus et staminodiis

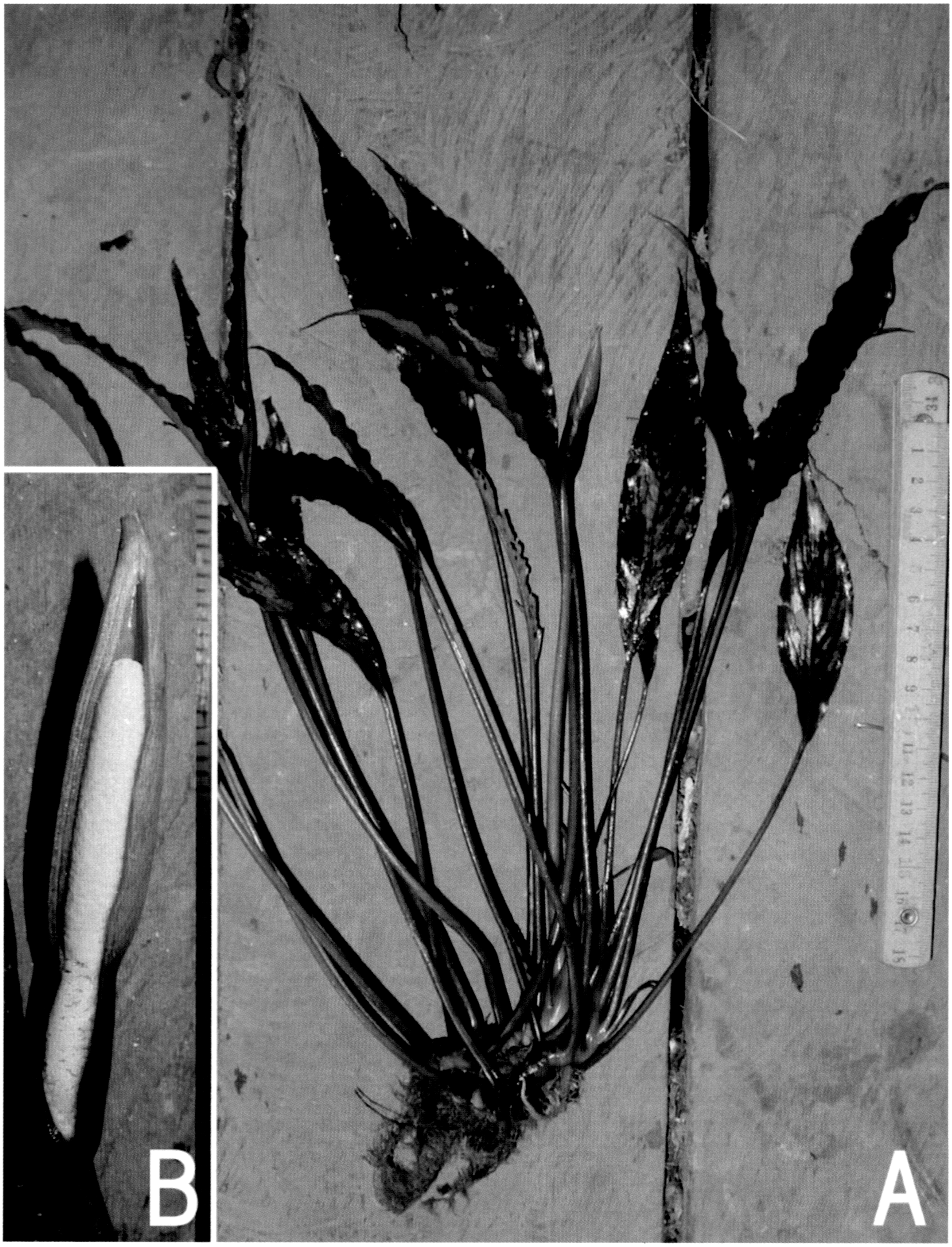

FIG. 1. Whole plant of *Piptospatha repens* collected from type locality (A). Thick stem crept on rock. B: Note color of fresh spathe and spadix. Spathe was partly moved to show spadix. Scale unit: A, 1 cm; B, 1 mm.

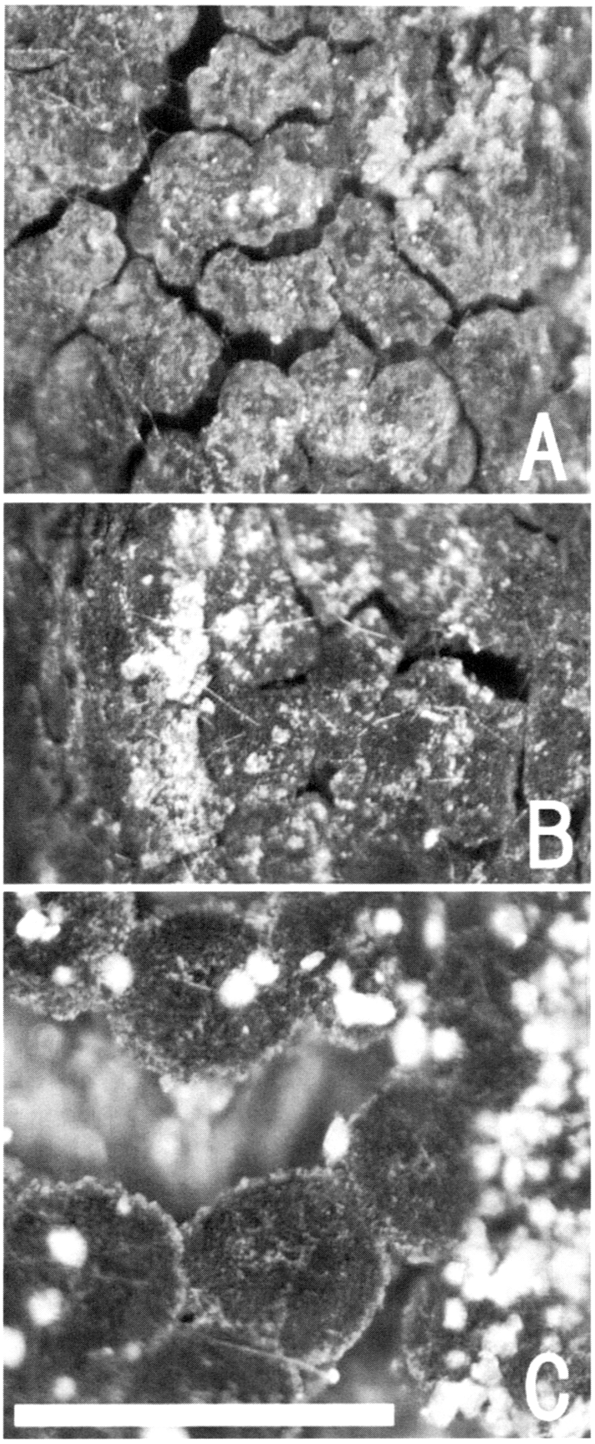

FIG. 2. Flowers on spadix from upper view. A: Male flowers. B: Intermediate staminodes. C: Female flowers. Scale in C: 1 mm. (photo from *Okada & al. O-58*, KYO)

intermediis praesentibus differt.

Typus. INDONESIA, West Kalimantan, Betung-Kerihun National Park: along a clear stream (Sg. Rongun), a branch on the right bank of Mendalam River, NE of Putussibau, Kab. Kapuas Hulu (01°01′52″–02′04″N, 113°16′12″–14″E), 2 January 2010, *H. Okada*, *H. Tsukaya* & *H. Nagamasu O-58* (holo- BO; iso- KYO).

Stem repent-creeping, rarely branching, sometimes more than 0.5 m in length, internodes 6–8 mm, ca. 6–8 mm in diam. *Leaves* petiole round, 15–18 cm long, about 1.5–2 mm in diam., clasping tightly stem at base, glabrous, crimson when young to dark green later; petiolar sheath adnate only at the extreme base, the remainder forming a free 4–5 cm long ligule; blade softly coriaceous, elliptic, 10–13 cm long and 2–3.5 cm wide, base cuneate, apex attenuate-acuminate, lustrous dark green adaxially, pale green abaxially, venation prominent, parallel, mid-vein robust, concave adaxially, convex abaxially, primary lateral vines 8–10, concave adaxially, secondary and tertiary venation obscure abaxially. *Inflorescence* solitary, peduncle 17 cm long, 1.5–2 mm in diam., immatute spathe 4.5–5.5 cm long, 5 mm wide, apex acuminate, upper 3/4 pale crimson, lower part crimson; spadix slender cylindrical, about 30 mm long and 3 mm wide, basal staminodial part 1–2 rays, white, following female part about 12 mm long, pink color, intermediate staminodial part about 2 mm long, pale creamy white, followed by male part about 17 mm long, pink. *Flowers* unisexual, naked. Basal staminodes cylindrical, 0.5–1 mm in diam., upper surface round, flat; female flowers consisting of an ovary about 0.5 mm in diam., cylindrical, stigma sessile, disk-like, about 0.5 mm in diam.; intermediate staminodes cylindrical, 0.5–1 mm in diam., upper surface irregular polygon, flat; male flowers cylindrical, upper surface elliptic, about 0.5 × 0.2 mm, flat. *Infructescence* not seen.

Distribution. Confirmed only from the type locality.

Habitat. The repent thick stems with tight internodes of this new species grow fastened with stout roots to a rocky riverside along a rapid stream with very clean water under a primary rain forest. At the time that this plant was found in the habitat, although the water level was low, all of the individuals were being soaked by water. This new species occupied lowest part of the rheophytic zone together with some typical rheophytic plants, i.e., *Elatostema* sp., Urticaceae (*Okada & al. O-50*, BO, KYO), *Myrmeconaulcea* sp., Rubiaceae (*Okada & al. O-29*, BO, KYO), and so on. Some rheophytic aroids also inhabited rheophytic zones of this area, such as *Aridarum burttii* Bogner & Nicolson (*Okada & al. O-61*, BO, KYO) on river banks, *Bucephalandra motleyana* Schott (*Okada & al. O-60*, BO, KYO) on wet rock, and some *Schismatoglottis* spp. on rock (*Okada & al. O-55*, BO, KYO), or on banks (*Okada & al. O-53*, BO, KYO).

Notes. Because locality of this species was very restricted and flowering individuals were very rare, we could collect only immature inflorescences. Spathe with color characteristics of upper 3/4 pale crimson, lower part crimson, however, shows this species has a caducous spathe like as species belonging to the *P. elongata* group (cf. Boyce & Hay 2000).

The chromosome number is 2n = 26 + Bs (Fig. 3) similar to *Piptospatha* cf. *burbidgei* Hotta ($2n = 26 +$ Bs, Okada 2001).

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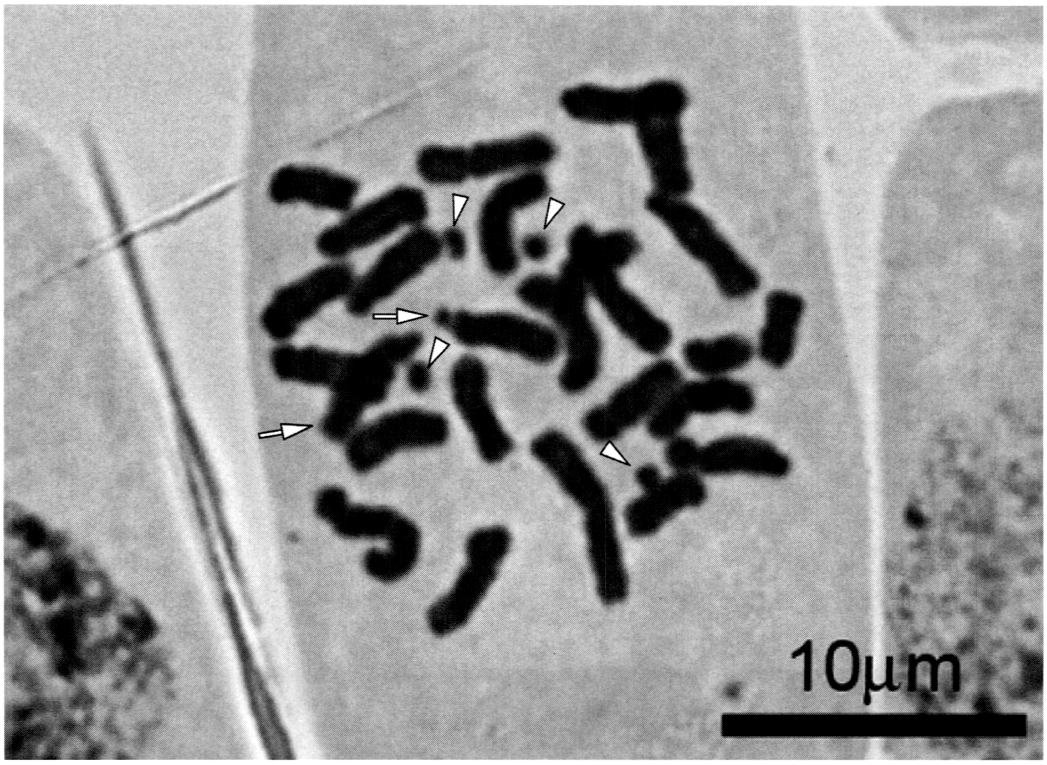

FIG. 3. Somatic metaphase chromosomes of *Piptospatha repens*, $2n = 26 +$ Bs. Arrows indicate satellite chromosomes, and arrowheads B chromosomes.

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APPENDIX. Key to *Piptospatha* species (partly modified key presented by Wong *et al.* [2009])

1a. Spathe limb caduceus; spadix about female flower zone shed directly after male anthesis; peduncle becoming erect and infructescence erect at fruit dispersal; fruits dispersing via "splash-cup" mechanic .... (*P. elongata* group) 2
1b. Spathe limb almost fully persistent until fruit dispersal; spadix axis persistent until well after fruit dispersal; peduncle declinate and infructescence pendent at fruit dispersal; fruit dispersal various (mostly unstudied except for *P. grabowskii*) but not via "splash-cup" mechanics .... (*P. grabouskii* group) 12
2a. Peduncle shorter than spathe; W. & C. Kalimantan .... *P. brevipedunculata* (H. Okada & Y. Mori) Bogner & A. Hay
2b. Peduncle much exceeding the spathe 3
3a. Sterile interstice well-defined 4
3b. Sterile interstice absent or not well-defined 5
4a. Stem short, erect, spadix thick (width of female zone : whole length = 5/18), female zone green, male zone pale yellow in color .... *P. burbidgei* (N.E. Br.) M.Hotta
4b. Stem long, repent, spadix slender (width of female zone : whole length = 3/30), pink in color .... **P. repens** H. Okada & H. Tsukaya
5a. Connective extended into a pronounced elongate beak; Sabah .... *P. insignis* N. E. Br.
5b. Connective not raised above the thecae or shortly elevated and obtuse 6
6a. Anthers pubescent to papillose 7
6b. Anthers glabrous 9
7a. Connective swollen; Peninsular Malaysia .... *P. ridleyi* N. E. Br. ex Hook.f.
7b. Connective not swollen 8
8a. Anthers in closely appressed regularly arranged pairs; Malay Peninsula and southern peninsular Thailand .... *P. perakensis* (Engl.) Engl.
8b. Anthers (seen from above) irregularly arranged; E. Kalimantan .... *P. manduensis* A. Hay & Bogner
9a. Spadix usually with slightly narrowed sterile appendix (male zone rarely fertile to apex); petiole with narrow crispate wings distally; Sarawak .... *P. truncate* (M. Hotta) Bogner & A. Hay
9b. Male zone fertile to apex; petiole without crispate wings distally; Sarawak 10
10a. Spadix bullet-shaped, the male portion tapering towards the apex; lower part of male zone comprised of larger flowers, that may be sterile intermixed adjacent to the pistils with white staminodes; thecae broadly

excavated, the excavations of adjacent anthers forming a butterfly-shaped depression; stigmas bright green; spathe at anthesis shading proximally to distally from deep olive-green through very pale pink to medium pink, the interior of the spathe tip rostrum with 5–7 conspicuous keels; persistent fruiting spathe wide-flared; plants frequently limestone associated .... *P. viridistigma* S. Y. Wong, P. C. Boyce & Bogner

10b. Spadix cylindrical; male flowers uniform throughout zone; thecae longitudinally sulcate with the pores ventral and dorsal to the sulcate; distally from deep plum purple through medium pink to deep pink, the interior of the spathe tip rostrum with 2–3 conspicuous keels or keels absent. Persistent fruiting spathe narrowly obconic; plants of sandstone or granite 11

11a. Stigmas mid-deep pink; anthers with connective flat; spathe tip rostrum almost straight or only weakly reflexed (ca. 45°) relative to spathe axis at anthesis, inside with 2–3 conspicuous longitudinal keels; plants exclusively of granite .... *P. elongata* (Engl.) N. E. Br.

11b. Stigma dirty whitish; anthers with a short acute-triangular connective on cach side, spathe tip rostrum strongly reflexed (ca. 130°) relative to spathe axis at anthesis, inside without keels or these only very vaguely defined; plants exclusively of sandstone .... *P. imoplita* S. Y. Wong, P. C. Boyce & Bogner

12a. Female zone free, stigmas as wide as ovary, usually on a distinct style; basal sterile zone partly adnate to spathe; widespread in Borneo .... *P. grabowskii* (Engl.) Engl.

12b. Lower part of female zone adnate to the spathe; stigmas narrower than ovary, sessile; NW Borneo .... *P. kinabaluensis* (Bogner) Bogner & A. Hay